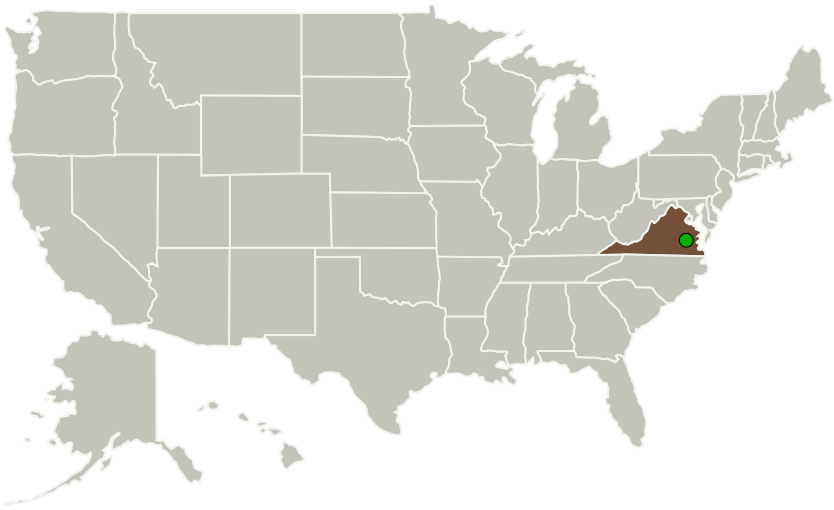
Coupled Viscous/Inviscid Analysis of Powered-Lift Airfoils and Wings, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

This proposal is in response to NASA SBIR Topic A2.08 in the area of "Variable Fidelity, Physics-Based Design/Analysis Tools". The development of a coupled viscous/inviscid analysis tool for powered-lift airfoils and wings is presented. In this context, powered-lift airfoils are taken to be airfoils under the influence of a high-energy jet, and include jet-flaps, augmenter-flaps, upper surface blowing, and circulation control airfoils. This methodology consists of coupling a viscous jet analysis, using a finite-difference approach, with a potential flow panel calculation. The method uses an iterative procedure to capture the effects of viscous mixing and determine the correct jet shape. The goal in developing 2-D powered-lift predictions is to couple this analysis with a pre-existing modified Weissinger method to accurately predict 3-D wing performance based on sectional data. In this manner, high-lift wing characteristics can be determined at a fraction of the computational cost of CFD. An MDAO framework for aircraft-level optimization will be developed with the goal of integrating the powered-lift analysis such that ESTOL concepts and technologies can be incorporated at the conceptual and preliminary design stages.

Primary U.S. Work Locations and Key Partners



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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Avid LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Yorktown, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138065)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Avid LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

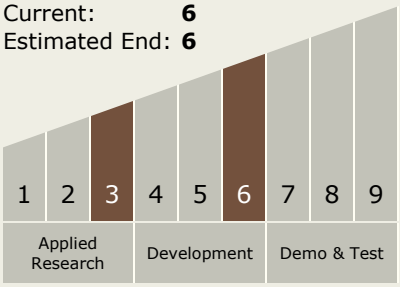
Carlos Torrez

Principal Investigator:

Ernie Keen

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.3 Aeroelasticity

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System